Claims

[c1] A method for image reversal in semiconductor processing, the method comprising:

forming a first implant mask layer upon a semiconductor substrate;

forming a patterned photoresist layer over said first implant mask layer;

removing portions of said first implant mask layer not covered by said patterned photoresist layer so as to expose non-patterned portions of said substrate;

removing said photoresist layer;

forming a second implant mask layer over said non-patterned portions of said substrate, wherein said first implant mask layer has an etch selectivity with respect to said second implant mask layer; and

removing the remaining portions of said first implant mask layer to expose a reverse image of said substrate, comprising initially patterned portions of said substrate.

[c2] The method of claim 1, wherein said first implant mask layer comprises a silicon antireflective coating layer.

[c3] The method of claim 2, wherein said silicon antireflective coating layer is formed upon an etch stop layer initially formed upon said substrate.

[c4] The method of claim 3, wherein said etch stop layer further comprises a first organic antireflective coating layer, and said second implant mask layer further comprises a second organic antireflective coating layer.

[c5] The method of claim 4, wherein said second organic antireflective coating layer is applied in a spin-on fashion and thermally cross-linked.

[c6] The method of claim 5, further comprising removing a portion of said second organic antireflective coating by chemical mechanical polishing so as to expose a top surface of silicon antireflective coating.

[c7] The method of claim 2 wherein removal of said silicon antireflective coating is implemented with a fluorine plasma reactive ion etch.

[c8] A method for implementing image reversal for semiconductor device implantation, the method comprising:
forming a first implant mask layer upon a semiconductor substrate;
forming a patterned photoresist layer over said first implant mask layer;
removing portions of said first implant mask layer not covered by said patterned photoresist layer so as to expose non-patterned portions of said substrate;

removing said photoresist layer;

subjecting said exposed non-patterned portions of said substrate to a first implantation;

forming a first implant mask implant mask layer over said non-patterned portions of said substrate, wherein said first implant mask layer has an etch selectivity with respect to said second implant mask layer;

removing the remaining portions of said first implant mask layer to expose a reverse image of said substrate, comprising initially patterned portions of said substrate; and

subjecting said exposed initially patterned portions of said substrate to a second implantation.

[c9] The method of claim 8, wherein said first implant mask layer comprises a silicon antireflective coating layer.

[c10] The method of claim 9, wherein said silicon antireflective coating layer is formed upon an etch stop layer initially formed upon said substrate.

[c11] The method of claim 10, wherein said etch stop layer further comprises a first organic antireflective coating layer, and said second implant mask layer further comprises a second organic antireflective coating layer.

[c12] The method of claim 11, wherein said second organic antireflective coating layer is applied in a spin-on fashion and

thermally cross-linked.

[c13] The method of claim 12, further comprising removing a portion of said second organic antireflective coating by chemical mechanical polishing so as to expose a top surface of silicon antireflective coating.

[c14] The method of claim 9 wherein removal of said silicon antireflective coating is implemented with a fluorine plasma reactive ion etch.

[c15] A semiconductor device, comprising:
a first implant region having a first conductivity type; and
a second implant region having a second conductivity type;
wherein said first and said second implant regions are self-aligned with respect to one another.

[c16] The semiconductor device of claim 15, wherein said first implant region is formed following a lithographic patterning step and said second implant region is formed following a non-lithographic, image reversal step.